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ABSTRACT

This report summarizes the results of three studies--the Regression Studies which investigated factors that are at least partly under the control of school personnel, the Outlier Study which used multiple regression analysis to identify schools that were performing either above or below their predicted levels of achievement as computed from nonschool factors, and the Observational Study which involved observation of 14 schools that were identified as above or below predicted achievement in the Outlier Study. Emphasis is given to the relationship between student achievement and school size, expenditures, special programs, traditional versus open education, teacher characteristics, school conditions, and staff attitudes. Summaries of factors associated with high and low achievement are presented along with factors showing ambiguous relationships with achievement and factors not associated with achievement. The most encouraging findings relate to teacher characteristics, staff attitudes, and school practices. The relationships described are not necessarily causal. (Author/IRT)

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WHICH SCHOOL FACTORS RELATE TO LEARNING?

Summary of Findings
of Three Sets of Studies

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Bureau of School Programs Evaluation
Albany, New York 12234

April 1976

EA 008 556

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FOREWORD

The Bureau of School Programs Evaluation of the New York State Education Department has for a number of years been developing procedures for evaluating the performance of schools and school districts. The Quality Measurement Project, running from the late 1950's to the mid-1960's, and the current Performance Indicators in Education Project were both developed to provide districts with more appropriate procedures for assessing their influence on student achievement.

Paralleling this interest has been an interest in what processes within schools influence achievement. To summarize research findings on this topic, a review was made of 97 studies dealing with factors related to student performance. Two reports resulted: one, a detailed description of methods and results;[1] the other, a summary which related the findings to ten questions about the effectiveness of education.[2]

With this background, the bureau launched its own studies of school processes to learn more about what schools can do to improve the achievement of students. Three strategies were used. One strategy, designated here as the Regression Studies, involved analyzing data in the Department's data files to determine how various school district factors relate to achievement. The second strategy, the Outlier Study, involved identifying high- and low-performing school buildings and analyzing school data to find variables which distinguished between the two groups. The third strategy, the Observational Study, called for observing in high- and low-performing schools to discover classroom processes which differentiated between the contrasting groups of schools. The studies had a common purpose: to identify relationships between school factors and student performance.

The present report summarizes the findings of the three sets of studies. An expanded edition, Three Strategies for Studying the Effects of School Processes, provides more detail on the procedures used in the studies. It is available from the Bureau of School Programs Evaluation.

A number of individuals contributed to the findings described here. The Outlier Study was carried out by Austin D. Swanson, Professor of Educational Administration, and Robert C. Nichols, Professor of Educational Psychology, both of the University of New York at Buffalo. The Observational Study was directed by Richard M. Clark, Professor of Educational Psychology of the University of New York at Albany. The Regression Studies were carried out by the staff of the Bureau of School Programs Evaluation: David J. Irvine, Chief; Gerald H. Wohlford; Guy D. Spath; and Philip J. Pillsworth. Gennaro DiGiovanni, who served as a public administration intern during the time these studies were under way, conducted several of the regression analyses. Mr. Spath coordinated the consolidation of the several studies into this report and the expanded edition.

John W. Polley
Associate Commissioner for
Research, Planning and Evaluation

TABLE OF CONTENTS

	Page
FOREWORD	iii
INTRODUCTION	1
OVERVIEW	2
THE STUDIES	2
Regression Studies	2
The Outlier Study	2
The Observational Study	3
FINDINGS	3
Is Size a Factor?	3
Do Expenditures Affect Learning?	4
How Are Special Programs and Services Related to Achievement?	4
Traditional vs. Open Classrooms	5
Do Teacher Characteristics Make a Difference?	5
How Do School Conditions and Practices Influence Learning?	7
How Do the Attitudes of the Staff Relate to Learning?	7
SUMMARY OF FINDINGS	8
Factors Associated with High Achievement	9
Factors Associated with Low Achievement	10
Factors Showing Ambiguous Relationships with Achievement	10
Factors Not Associated with Achievement	10
DISCUSSION	11
REFERENCES	12

INTRODUCTION

Public interest in education has increased in recent years. The causes of this increased interest are diverse. Education accounts for the single largest government expenditure in New York State, to cite one possible cause; and in time of economic pressures, taxpayers and government officials scrutinize expanding budgets. Beyond fiscal concerns, the basic philosophy of American education is being questioned. Education has long been considered one of the most important routes to success. Disillusionment with massive attempts to improve education has brought this belief under fire. Finally, much educational research has emphasized the importance of student background and, by contrast, de-emphasized the importance of the schools in stimulating students' learning. This has led many people to ask, "Does schooling make a difference?"

It is not sufficient to say that schooling does or does not do what is expected of it. In order to improve the schools it is necessary to understand the effects of various school factors on different students. Many effects are logical or are known intuitively to educators and the public. But the difficulty of improving the performance of students, even with massive infusions of funds, has illustrated the limits of our knowledge. For this reason, educational research has turned more and more to attempting to discover which school factors relate to student learning. This is the direction explored by the research reported in the present document.

Some cautions are in order. This document focuses on school factors as they relate to student performance in reading and mathematics only. It is possible that these school factors relate to other kinds of student performance in different ways. It is also possible that factors found here to be unrelated to student performance in reading and mathematics are quite important for other kinds of performance. Still other factors may be important to the quality of life in educational institutions although they have no apparent impact on student performance. For these reasons, changes made in school programs to improve student performance in reading and mathematics should be examined for possible effects on other aspects of student functioning.

This report is a summary of research conducted by the staff of the Bureau of School Programs Evaluation and by consultants under contract to the bureau. It focuses on the findings of the studies. A more detailed description of the studies is available in Three Strategies for Studying the Effects of School Processes.

OVERVIEW

Three sets of studies of school factors were conducted under the aegis of the Bureau of School Programs Evaluation. All of the studies had the purpose of identifying school factors which relate to the achievement of students. They are reported in detail in Three Strategies for Studying the Effects of School Processes. The present report describes briefly the three sets of studies and summarizes the findings.

The studies reported here were designed to complement an earlier bureau publication, What Research Says About Improving Student Performance.[2] That publication summarized the results of 97 research studies dealing with the relation of a variety of school factors to school outcomes, whereas the present report attempts to integrate findings of research done more recently in the schools of New York State.

It is hoped that the results reported here can provide a basis for thoughtful discussion and, together with other information, suggest directions which can be pursued to improve education. By its very nature, the research does not offer simple answers to the complex questions confronting education today. But if the findings seem to be cautiously interpreted, perhaps that fact will help us avoid rushing to conclusions or jumping on bandwagons.

THE STUDIES

Regression Studies

The first set of studies, carried out by the bureau staff, investigated factors which are at least partly under the control of school personnel. As in the Coleman Report, the effects of nonschool factors were controlled and the unique contributions of school variables were studied. The studies are referred to throughout the report as the Regression Studies.

The Outlier Study

The second type of study used multiple regression analysis to identify schools which were performing either above or below their predicted levels of achievement, as computed from nonschool factors. The study focused on school buildings rather than school districts. Three groups of schools were identified: 1) High outliers, those schools whose actual mean achievement scores were well above their predicted scores; 2) Low outliers, those schools whose actual scores were well below their predicted scores; and 3) Midliers, those schools whose actual scores fell near their predicted scores. These three groups of

schools were compared through analysis of variance in an attempt to determine the effects of a number of variables which reflect school processes. Because this study emphasized schools which lay some distance from their expected levels of achievement, it was dubbed the Outlier Study.

The Observational Study

The third kind of study involved observing in 14 schools which were identified as above or below predicted achievement in the Outlier Study described above. Observational instruments, interviews, and questionnaires were used to obtain information about classroom activities, interactions among students and staff members, and perceptions of staff members. This study is referred to as the Observational Study.

FINDINGS

While each of the sets of studies described above used a somewhat different approach, their findings are consolidated below in an attempt to develop a coherent, though not necessarily complete, picture of how school processes relate to school outcomes. Where the results are contradictory or ambiguous, an attempt is made to show this.

Is Size a Factor?

The average school district enrollment in New York State in 1971 and 1972 was approximately 2500, ranging from 30 to over 30,000. In the Regression Studies, district enrollment was found to be negatively related to achievement; that is, larger districts had poorer average achievement. However, when total population of districts was considered, it replaced enrollment as a predictor. This seems to suggest that the negative relationship between enrollment and achievement is a function of urbanness rather than of school size. The finding, then, does not appear to offer evidence about the optimum size of schools or school districts.

The Outlier Study showed no difference in size between high and low outlier schools; each group averaged about 100 fewer students than did schools identified as midliers. In addition, classes tended to be smaller for both positive and negative outliers than for midliers. As has been suggested in other studies, the effect of class size may be dependent on the type of student and on the subject being taught.

Do Expenditures Affect Learning?

Several types of expenditures were investigated. Since the largest single expenditure for education is for salaries, teachers' salaries were studied in several different ways.

The Regression Studies revealed a positive relationship between median teacher salaries of school districts and average student achievement in the districts. These findings were supported by the Outliers Study, in which teachers in schools achieving above expected earned the most money and teachers in schools achieving below expected received the least. While these findings do not mean that higher salaries produce higher performance, they indicate that the more successful districts do pay higher salaries. Not unexpectedly, salary-related variables, such as graduate credits and experience of teachers, were also shown to be related to achievement. It is interesting to note that an earlier study, using 1969 data, showed that the amount of money spent per pupil on principals' salaries was also related to achievement.

The Regression Studies also examined full tax value and several district per-pupil expenditures, including total expenditures and expenditures for regular day instruction, for teachers, for central administration, and for principals. No consistent relationships were found, in spite of the fact that wide variations were observed from district to district.

How Are Special Programs and Services Related to Achievement?

Special programs frequently showed negative relationships with achievement. The Outlier Study, for example, revealed a negative relationship between achievement and special programs for the handicapped. Guidance, social work services, and attendance services were also negatively related to achievement, while programs for the academically talented were more likely to be found in the high outlier schools. These findings can be misleading if cause and effect are assumed. Such programs are most likely to be found where they are most needed. Therefore, it is not surprising to find that more special programs are found where achievement is low. In addition, the data available for these studies did not clearly distinguish between types of special programs; it is likely that some types of programs affect students differently from other types of programs.

In the Observational Study, high-achieving schools were rated as having higher total activity in nine of eleven reading activities, especially in silent reading, than did low-achieving schools. The Outlier Study showed that the use of rooms for academic rather than vocational study also correlated positively with achievement. The Regression Studies indicated a positive relation between attendance rate and achievement, but this relationship disappeared when socioeconomic factors were considered. The same phenomenon occurred in a study of student mobility.

Traditional vs. Open Classrooms

Attempts to move away from traditional, teacher-centered classroom arrangements have included many innovations designed to increase learning. The Outlier Study showed that most classrooms in the schools studied were traditional, with the smallest number of traditional classrooms being found in low outlier schools and the greatest number in midlier schools. High outliers were more likely to have open classrooms and multi-age groupings. Multi-unit groupings were negatively related to performance. Midlier schools were less likely to have innovative programs than either of the other two groups of schools. Other organizational arrangements were not significantly related to achievement. These included clustering, continuous progress, departmentalization, differentiated staffing, dual progress plan, house plan, modular scheduling, non-graded, self-contained, and team teaching. The Observational Study supported the findings of the Outlier Study in respect to open classrooms.

Do Teacher Characteristics Make a Difference?

When candidates for teaching positions walk into a school superintendent's office, they bring with them certain personal and professional characteristics. Among these are their professional training and experience, age, sex, marital status, and a variety of personal traits. The superintendent may have very little concrete evidence to use in selecting among candidates with an almost infinite number of combinations of professional and personal characteristics. Does a candidate with a doctorate have more to offer than one with many years of experience but less in the way of formal education? Are women more effective than men in elementary schools? How important is graduate school training when the teacher is expected to teach reading to eight-year-old children?

The New York State Education Department collects data on teachers in each of the school districts in the state. From the available data, five teacher characteristic variables were selected for study:

1. Median Age of Teachers in the District
2. Median Years of Experience
3. Percent of Married Teachers
4. Percent of Male Teachers
5. Percent of Teachers Having Graduate Credit

The Regression Studies revealed no relationships between teacher age or experience and average student achievement in a district. The Outliers Study, on the other hand, showed a positive relationship between teacher experience and student performance. Furthermore, a larger percentage of the teachers in the high outlier schools were on tenure.

The percent of teachers having some graduate training showed the most consistent relationship with reading and mathematics achievement in the Regression Studies. Even after controlling for socioeconomic factors, percent of teachers having 30 or more credit hours beyond the bachelor's degree demonstrated a significant relationship to all of the achievement criteria.

Significant shifts in teacher certification took place from 1970 to 1971. In 1970 only 230 districts had all teachers certified while in 1971 this number increased to over 480. The Regression Studies of this variable showed a definite negative relationship of percent uncertified to student achievement in 1970. The tremendous reduction in number of schools having uncertified teachers in 1971 led to less conclusive results for that year, but the inference still seems warranted that certification is desirable.

The positive findings on certification and graduate training were both supported in the school-building analyses carried out in the Outliers Study.

Using regression analysis to study school buildings, it was found that schools with a greater percentage of Black teachers had higher levels of performance, after controlling for non-school factors.

The findings on sex and marital status were mixed. In 1971, no relationship was found between percent of married teachers in a district and achievement. In 1972, a positive relationship was evident. Percent of male teachers was negatively related to all achievement criteria in 1972 but only to sixth-grade mathematics in 1971.

While these results suggest that relationships exist between student achievement and teacher graduate training, it should be noted that these relationships may reflect other factors related to both achievement and teacher characteristics. For instance, we know that low socioeconomic school districts tend to have low mean scores on achievement tests and high socioeconomic districts tend to have high mean scores. The positive relationship that seems to exist between percent of teachers with graduate credits and student achievement may simply reflect a tendency among higher socioeconomic districts to employ teachers with graduate training. Conversely, the lower socioeconomic districts may not have the money to pay the higher salaries of teachers with graduate credits.

The hypothesis that these teacher characteristic relationships are merely reflective of the known relationship between socioeconomic status and achievement is even more tenable regarding teacher marital status and sex. Lower socioeconomic districts might be expected to hire more men since women might be unwilling to teach in those districts. And, with a higher teacher turnover rate, these districts could be expected to have a lower percentage of married teachers.

How Do School Conditions and Practices Influence Learning?

Logic suggests that school conditions and practices which impinge directly on the daily lives of students offer the most promise for improving education. Yet in many ways they are the hardest to study.

The Observational Study attempted to obtain data which would make it possible to understand better the importance of certain conditions and practices. Some of the results are summarized below:

1. Teachers in high outlier schools made less overt effort to maintain class control, had less rigid student behavior, but were more efficient in maintaining the level of control they appeared to want than were teachers in low outlier schools.

2. Teachers in high outlier schools were rated as warmer, more responsive, and placing more emphasis on cognitive development.

3. More total activity takes place in reading classes in the high outlier schools.

4. Children in high outlier schools engage in more silent reading while children in low outlier schools engage in more oral reading.

5. In grades one to three, teachers in high outlier schools gave more positive and less negative reinforcement than did teachers in the low outlier schools.

6. In grades four to six, teachers in low outlier schools gave more reinforcement. In general, however, they tended to use negative reinforcement more than the teachers in the high outlier schools.

7. Pupils in the high outlier schools were more enthusiastic and were better able to sustain attention.

8. On selected items related to open education, the high outlier schools appeared more often.

9. Items on physical space and facilities generally did not differentiate between high and low outlier schools.

How Do the Attitudes of the Staff Relate to Learning?

The attitudes of teachers are frequently cited as influences on the performance of students. For that reason a number of attitudes, perceptions, and expectations of teachers and other staff members were

investigated in the Observational Study. The findings include the following:

1. Teachers in high outlier schools expected more children to graduate from high school, to go to college, to become good readers and to become good citizens than did teachers in low outlier schools.

2. Teachers in high performing schools saw their children as more intelligent, better behaved, more pleasant to teach, and their parents as more concerned.

3. Teachers in high and low outlier schools were not different in the amounts of help they perceived as being available in handling problems.

4. Reading teachers in the high outlier schools gave more favorable evaluations of the reading programs in their schools than did reading teachers in low outlier schools. The former also rated the classroom teachers more favorably in using appropriate materials, extending reading into other areas, asking children to read with purpose, and using informal diagnosis.

5. Principals in high outlier schools generally saw their personnel as more competent than did principals in low outlier schools.

6. Principals in high outlier schools saw themselves as having better rapport with teachers, parents, and pupils than did the principals in low outlier schools. However, principals in low outlier schools reported better rapport with the school board.

SUMMARY OF FINDINGS

Summarizing the findings of a group of related studies presents a number of difficulties. The volume of results resists a concise treatment. Attempting to discuss the results in simple terms may produce misleading conclusions. The ambiguities and contradictions between the findings of different studies may defy easy explanations.

A particular problem in interpreting cross-sectional data which these studies used, involves the extent to which variables can be inferred to cause the outcomes with which they are associated. It is part of the litany of research that "correlation does not imply causation." However, there is a human tendency to jump to conclusions about cause and effect. Findings such as those presented here should be interpreted with restraint and logic in order to avoid faulty conclusions.

One area in which a logical analysis of the situation may avoid incorrect conclusions has to do with the findings that special programs are frequently associated with low achievement. A hasty conclusion may be that the special programs are ineffective or actually detrimental to

student achievement. However, many special programs--for the handicapped or for the disadvantaged, to cite two instances--have been implemented to meet particular needs. A negative correlation between the prevalence of special programs and achievement, rather than meaning that the programs have adversely affected achievement, indicates that the programs are located where they are needed.

In spite of the possible problems of interpretation, it seems that a summary of findings from the three types of studies may be useful. The following summary shows which variables were associated with students' achievement in reading and arithmetic after social and economic factors were accounted for.

Factors Associated with High Achievement

High achievement of students was associated with the following factors:

1. Higher teachers' salaries.
2. Use of rooms for academic rather than vocational study.
3. Open classrooms.
5. Multi-age groupings.
5. Higher levels of graduate training of teachers.
6. Larger percent of Black teachers.
7. Better control of classes but with less overt effort on the part of teachers to maintain control.
8. Less rigid student behavior.
9. Greater teacher warmth and responsiveness.
10. Greater emphasis by teachers on cognitive development.
11. More total activity in reading classes.
12. More silent reading.
13. Positive reinforcement of students by teachers.
14. More enthusiasm on the part of students.
15 Better ability on the part of students to sustain attention.
16. Higher expectations on the part of teachers for their students to become good readers and good citizens, to graduate from high school, and to go to college.
17. Teachers' perceptions of their students as more intelligent, better behaved, and more pleasant to teach and the students' parents as more concerned.
18. More favorable ratings by reading teachers of the reading program in their schools.

19. More favorable ratings by reading teachers of classroom teachers in using appropriate materials, extending reading into other areas, asking children to read with purpose, and using informal diagnosis.
20. Higher ratings by principals of the competence of personnel in their schools.
21. Principals' perceptions of a high level of rapport with teachers, parents, and pupils.

Factors Associated with Low Achievement

Low achievement of students was associated with the following factors:

1. Larger district enrollment.
2. Special programs for the handicapped.
3. More pupil services, including guidance, social services, and attendance services.
4. Multi-unit plans.
5. Larger percent of uncertified teachers in a district or school.
6. More oral reading.
7. Negative reinforcement of students by teachers.
8. Principals' perceptions of a high level of rapport with the school board

Factors Showing Ambiguous Relationships with Achievement

A number of variables showed ambiguous relationships with student achievement. Among these were:

1. Class size.
2. Per-pupil expenditures for instruction, teachers, principals, and central administration as well as total per-pupil expenditures.
3. Median years of experience of teachers in a district.
4. Percent of married teachers in a district.
5. Percent of male teachers in a district.

Factors Not Associated with Achievement

Several variables were found not to be associated with achievement. Among these were:

1. Attendance rate, once socioeconomic factors are considered.
2. Student mobility.

3. Various organizational and grouping arrangements, including clustering, continuous progress, departmentalization, differentiated staffing, dual progress plan, house plan, modular scheduling, non-graded, self-contained, and team teaching.
4. Median age of teachers in a district.
5. School facilities and space.
6. Teachers' perceptions of the amount of help available in handling problems.

DISCUSSION

In many respects, the findings of these studies seem to agree with other research conducted during the past decade. However, some very logical, long-held assumptions about the effects of certain system-wide administrative variables are not supported. None of the "expected" relationships with achievement were demonstrated for attendance, mobility, special compensatory programs and services, and gross expenditure variables.

Mixed results were found for class size, school size, and innovative programs. Smaller classes in smaller schools and innovative programs appear to be found in both high and low outliers.

The most encouraging findings related to teacher characteristics, staff attitudes, and school practices. Results of the several studies indicate that good teachers are the heart of the educational system, as conventional wisdom would suggest. Students seem more likely to achieve well where teachers are better trained, more often certified, higher paid, and more likely to be tenured. The teachers in high performing schools have higher expectations for their students and more favorable perceptions of them; they appear to be warmer, more supportive, and more responsive. This is accompanied by more enthusiastic students. Teachers in more successful schools also appear to deemphasize strict control and lean toward more open education. These studies do not inform us as to what "better" teachers do to bring about high achievement, nor do they explain why a warmer, more open environment is more conducive to learning.

The relationships described are not necessarily causal. Generalizations drawn from these studies should be considered in the light of other research and the decision maker's experience and unique situation. These findings are offered as one more bit of information which can contribute to an understanding of educational processes. One conclusion seems apparent: Studying district-wide variables and school variables seems to be less rewarding than studying the teaching-learning interface.

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